Eur Arch Otorhinolaryngol (2005) 262: 507–511
DOI 10.1007/s00405-004-0841-x

MISCELLANEOUS

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Long-term outcome and health-related quality of life in benign paroxysmal positional vertigo

Received: 29 April 2004 / Accepted: 8 July 2004 / Published online: 16 November 2004

Abstract A prospective cohort study was designed to evaluate the long-term outcome and health-related quality of life (HRQoL) in patients with posterior canal benign paroxysmal positional vertigo (PC-BPPV) treated by the particle repositioning maneuver (PRM) in the outpatient clinic of a general community hospital. Fifty individuals with PC-BPPV were included, and 45 (90%) completed the study. The diagnosis was based on the history of short episodes of vertigo and a positional nystagmus during the Dix-Hallpike test (DHT). All patients were treated by a single PRM, and relapses were evaluated by DHT at 30, 180 and 360 days post-treatment; a new PRM was performed if the DHT was positive. The main outcome measures were: percentage of patients with a negative DHT after treatment, scores obtained on the Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) and the Dizziness Handicap Inventory Short Form (DHI-S) before and 30, 180 and 360 days post-treatment. The DHT was found negative in 80% (40/50) of individuals at 30 days. Ten, seven and five patients presented a positive DHT at 30, 180 and 360 days, respectively. Persistent BPPV was observed in 5% (2/50) of patients at 360 days, despite repeated PRM. Relapses (DH+ after successful PRM) were observed in 7.5% (3/50) at 180 days and 360 days. Both questionnaires showed a reliability Cronbach's alpha >0.7. The average standardized score for each SF-36 scale was compared with the reference population normative data, showing differences with norms for all scales except for vitality. After PRM, patients improved their scores with both instruments, indicating a restoration of HRQoL at 30 days. Physical dimension scores of the SF-36 improved from day 30 to 360. DHI-S scores were statistically better after PRM ($P<0.001$). Our results show that the effectiveness of PRM is 88% after 1 year of follow-up. Patients with BPPV experienced a decrease in HRQoL, which was restored after PRM. Although relapses were observed in 7.5% of individuals, they did not affect HRQoL.

Keywords BPPV · Vestibular habituation · Vestibular training

Introduction

Benign paroxysmal positional vertigo (BPPV) is one of the most common vestibular disorders with a safe and highly effective treatment. It is characterized by short episodes of vertigo that are elicited with the rapid stimulation of the affected semicircular canal resulting in nystagmus [1, 2]. The canal most commonly affected is the posterior one, but lateral and anterior canals can be involved [3, 4]. The diagnosis of posterior canal BPPV is based on the observation of a characteristic positional nystagmus when the Dix-Hallpike test (DHT) is performed [5, 6].

The most widely accepted treatments are the canalith repositioning procedure (CRP) described by Epley and a modification of this maneuver, the particle repositioning maneuver (PRM) [1, 2]. The treatment entails a sequence of movements of the head and trunk to rotate the posterior semicircular canal in a plane that displaces the canaliths from the canal into the utricle, where it is inactive [1].

The efficacy of the treatment in randomized controlled trials has yielded an odds ratio for conversion of a positive to negative DHT of 5.67 (95% confidence interval 2.21 to 14.56) in favor of treatment [7]. However, the natural history of BPPV is poorly understood, and vertigo can relapse after successful treatment. The

This study was presented at the Research Forum of the AAO-HNSF and the Association for Research in Otolaryngology (ARO) Annual Meeting held in Orlando, FL, on September, 23, 2003

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percent of the recurrence rate per year observed is around 15% [8], and there is no evidence that the PRM can reduce later recurrences of BPPV.

Quality of life is defined as an individual's perceptions of his/her position in life in the context of the culture and value systems in which he/she lives, and it encompasses a broad spectrum of domains including health status, economic resources, work status, relationships and leisure activities [9]. Health-related quality of life (HRQoL) is used to denote that portion of the quality of life that is influenced by a person's health.

Many validated instruments are intended to measure HRQoL, either disease-specific such as the Dizziness Handicap Inventory (DHI) for vertigo patients [10], or generic as the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) [11]. The SF-36 has been widely used in studies of the outcome for chronic diseases, and it facilitates comparison of the clinical health of BPPV patients with the average standardized scores of the general population [12]. In a previous study, it was found that patients with PC-BPPV experienced a decrease in HRQoL as compared with norms at 30 days post-treatment [13]. Therefore, PC-BPPV affected the physical and social functioning role because of emotional problems and mental health perception [13]. However, little is known about the long-term outcome of PRM and its impact on HRQoL in patients with BPPV. The present study provides a description of the long-term outcome of PRM in BPPV using the SF-36 Health Survey and the DHI Short Form (DHI-S) [14].

Subjects and methods

Patients

A prospective study including 50 consecutive outpatients with PC-BPPV (35 women and 15 men) was carried out between April 2001 and March 2003. The diagnosis of unilateral PC-BPPV was made on the basis of the history of short episodes of vertigo in association with rapid changes in head position and confirmed by the observation of up-beating torsion-induced nystagmus during the DHT. Patients with lateral or anterior canal BPPV were excluded. A neuro-otologic examination was conducted at the initial visit, and written information concerning the purpose of the study and its confidentiality was given to patients. Informed consent was obtained for all subjects after the PRM was explained prior to their inclusion in the study. All patients were treated by a single PRM without mastoid and were instructed to sleep sitting the first 2 nights. Relapses were investigated by the same physician at 30, 180 and 360 days post-treatment, and the effectiveness of PRM was evaluated by the DHT. A new PRM was performed if the DHT was positive. The Ethical and Research Committees of the hospital approved the research protocol.

Thirty-six Item Short Form Health Survey (SF-36)

The SF-36 instrument is a validated and widely used general HRQoL survey that assesses eight areas (domains) of general health [11]. The eight areas relate to physical functioning (PF), role limitation due to physical functioning (RP), bodily pain (BP), general health (GH), vitality (VT), social function (SF), role limitation due to emotional problems (RE) and mental health (MH) perceptions. Each dimension score is standardized and ranges from 0–100, with higher scores representing better HRQoL. For example, dimensions on function are scored so that the higher the score, the better the function in question, and the pain dimension is scored so that the highest score indicates freedom from pain. The SF-36 has been validated for use in Spain, and normative data on the general population have been reported [12].

Dizziness Handicap Inventory Short Form (DHI-S)

The Dizziness Handicap Inventory (DHI) is a 25-item scale that was designed to evaluate the effect of dizziness and unsteadiness on the functional, emotional and physical aspects of everyday life [10]. A screening version of the DHI, the DHI Short Form (DHI-S), was also developed, and its scores were highly predictive of those on DHI [14]. The DHI-S consisted of the ten items on the DHI having the highest item-total correlation. For each item, the subject was instructed to respond ''yes'', ''no'' or ''sometimes.'' The DHI-S scores range from 0 (best possible measured health) to 40 (the worst possible), and it has been adapted to Spanish, showing high internal consistency reliability values.

Statistical procedure

The descriptive statistics are presented as means with standard deviations. For SF-36, a raw score was calculated for each dimensions by summing the responses for all items on that dimension; each raw score was then transformed into a 0–100 scale using the formula specified in the SF-36 scoring manual. For each SF-36 dimension, Cronbach's alpha (CA) coefficient was calculated to estimate internal consistency reliability. Reliability coefficients equal to or higher than 0.70 have been recommended for group comparisons [15]. The SF-36 scores for each patient obtained on days 1, 30, 180 and 360 were compared with the Spanish SF-36 normative data, after standardization of scores [12]. The procedure to standardize the scores already has been published [15]. Briefly, the difference between the individual's raw score and the mean score of the corresponding Spanish normative group (determined by age and gender) was calculated and divided by the standard deviation of the normative group. These standard scores (z-scores) express the individual's distance from their

normative group mean in terms of the standard deviation of the distribution. Any score equal to the normative mean will be equivalent to a z-score of zero.

Parametric methods were used, because the procedure of summated scales is based on these methods. Total scores on DHI-S were calculated before PRM and 30, 180, 360 days post-treatment, and analysis of variance was used to compare DHI-S total scores before and after treatment. Statistical significance was accepted if $P < 0.05$.

Results

Effectiveness of treatment

The mean age of the 50 patients was 55.05 ± 15.27 (SD). Forty-one patients had idiopathic or primary BPPV of the posterior semicircular canal; eight presented BPPV after head trauma, and one woman had a definite bilateral Meniere's disease and a history of head trauma. Eighty percent (40/50) of individuals did not refer to new episodes of vertigo and were DH negative at 30 days. Twenty percent (10/50) of patients presented a DH+ at 30 days, indicating a failure in response to PRM. Seven and five patients remained DH+ at 180 and 360 days, although most of them described an improvement of symptoms (they described shorter episodes or tried to avoid the precipitating position). Persistent BPPV was observed in 5% (2/50) of patients at 360 days, despite repeated PRM (the woman with Meniere's disease and an idiopathic case). Relapses (DH+ after one successful PRM) were observed in 7.5% (3/50) at 180 and 360 days.

Health-related quality of life (HRQoL) in PC-BPPV

Forty-five individuals completed all questionnaires. Five individuals were excluded because of inadequate follow-up. The CA coefficients were calculated for each scale at the first administration of the SF-36, and all coefficients were higher than 0.70. CA coefficients for the DHI-S total score and emotional, physical and functional subscales were also calculated. Unfortunately, DHI-S subscale reliability coefficients were lower than 0.70, and comparisons were limited to the DHI-S total score. Table 1 shows the scale score distribution obtained on the SF-36 in patients with BPPV before and 30, 180 and 360 days post-treatment.

The average standardized scores for each scale of the SF-36 were plotted in relation to the scores of individuals from the Spanish general population in Fig. 1. The mean on each SF-36 scale for the general population was set to 0. All scale scores were below the mean of the general population. PF and RF were −0.87 and −0.83 SD before treatment, but both improved after PRM to −0.45 and −0.66, respectively. Additional improvements were observed in SF, VT and MH scores (from −0.96, −0.26 and −0.69 to −0.42, 0.20 and −0.22, respectively), which were maintained after 1 year of follow-up. Unfortunately, none of these differences in scores were statistically significant. SG, BP or RE scores did not change after PRM. However, SF-36 standardized scores were not different between individuals with positive and negative DHT at 30, 180 or 360 days. The DHI-S scores in PC-BPPV patients are shown in Fig. 2. The DHI-S total score showed a significant decrease at 30, 180 and 360 days post-treatment ($P < 0.001$).

Discussion

Our study found that 10% of patients with PC-BPPV may have a persistent or relapsing clinical course after 1 year of follow-up, despite repeated treatments with the PRM. Although most patients have a non-recurrent course, recurrences are frequently observed and the rate of recurrence per year reported is 15–45% [8, 16, 17]. However, previous studies estimated the recurrences by follow-up questionnaires sent by mail [16] or telephone calls [8, 17] and did not perform a DHT to evaluate the effectiveness of PRM. The gold standard for success in treating BPPV is a negative DHT result [8], and we repeated DHT in all patients at 30, 180 and 360 days of follow-up.

Table 1 Score distribution of the SF-36 in BPPV patients before and 30, 180 and 360 days post-treatment. *PF* physical functioning, *RP* role: physical, *BP* body pain, *GH* general health, *VT* vitality, *SF* social functioning, *RE* role: emotional, *MH* mental health

Scales	Before treatment		30 days		180 days		360 days	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
PF	65.38	24.13	72.30	26.42	73.97	23.79	75.53	24.49
RP	48.13	38.14	60.53	45.39	70.63	44.54	73.08	39.48
BP	61.60	27.76	66.03	29.11	61.18	26.03	66.13	26.90
GH	50.79	22.41	50.13	23.21	51.10	24.74	54.50	19.24
VT	48.88	24.35	57.11	24.43	57.44	24.57	61.15	21.81
SF	68.44	24.83	80.19	21.08	80.94	21.18	81.09	25.31
RE	52.99	45.06	57.02	45.82	61.54	46.85	62.50	46.03
MH	57.50	23.90	66.53	24.34	64.82	22.46	68.00	24.62

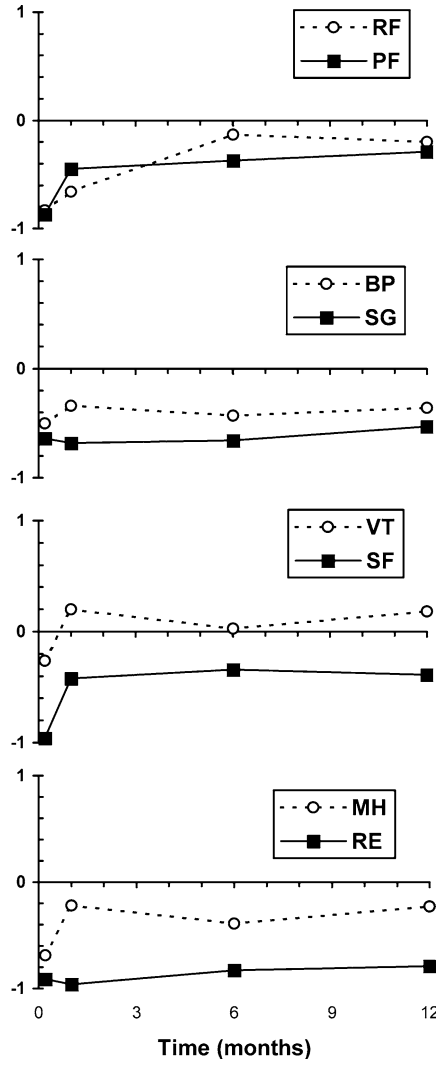

Fig. 1 Time course of SF-36 scales z-scores in patients with BPPV

The natural history of BPPV is incompletely understood. Although spontaneous resolution of symptoms is observed, it is also clear that patients reporting symptoms with a negative DHT became DH+ after several months of follow-up, suggesting a relapsing course. It is not known whether repositioning can alter the natural history of recurrences of BPPV. Our study demonstrates that repeated PRM did not significantly alter the recurrent course in 10% (5/50) of patients with PC-BPPV after 1 year of follow-up. Among these five patients, two of them showed persistent BPPV (the woman with Meniere's disease and an idiopathic case) and were DH+ at 30, 180 and 360 days, despite repeated PRM; they were considered intractable [18]. The other three individuals presented a relapsing course: DH+ at 30 days was successfully treated, becoming DH− at 180 days, but symptoms reappeared and were DH+ at 360 days.

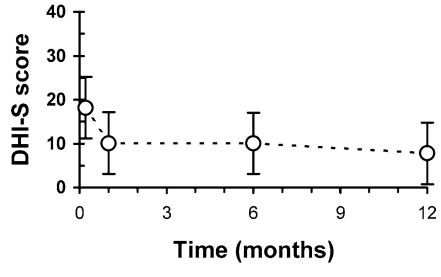

Fig. 2 Mean scores obtained on the DHI-S in patients with BPPV. *Error bars* are SD

Our results are in agreement with those observed in randomized clinical trials, and the effectiveness of PRM observed at 30 days was 80% [19, 20]. Persistence of positional nystagmus on the DHT after PRM may be explained in two ways. First, the canalith is incompletely returned into the utricle by a single PRM, and some particles remain in the posterior canal. Because of this, some patients require a second or third PRM to become DH negative [21]. Second, the causes that facilitate the shedding of otoconia from the utricular macula probably persist (i.e., the position in bed or another vestibular lesion also causing positional vertigo may coexist with PC-BPPV) in patients with persistent positional nystagmus and BPPV. In these cases, a MRI was obtained to rule out a cerebellar or midbrain tumor.

The assessment of health-related quality of life has a key role in long-term evaluation of outcome research in chronic diseases [15]. BPPV is a chronic disease characterized by a recurrent clinical course (cluster of short episodes of positional vertigo followed by long asymptomatic periods) [22].

This is the first study to evaluate the effect of PRM on HRQoL in BPPV patients at long-term. PF, RF, VT, SF and MH SF-36 scale scores showed an improvement after PRM that was maintained at 180 and 360 days, although this improvement was not significant. However, the SF-36 scores could not discriminate between individuals with DH positive or negative at 30, 180 or 360 days. This is probably due to the low number of patients with positive DHT (10, 7 and 5, respectively).

The DHI-S is a reliable measurement to assess the severity of vertigo, including BPPV [13, 23], and it is extremely useful for monitoring the impact of vertigo on daily activities. In this study, a significantly lower score in DHI-S was obtained after PRM at 30, 180 and 360 days.

Conclusions

The effectiveness of PRM is 88% after 1 year of follow-up. Patients with BPPV experienced a decrease in HRQoL, which was restored after PRM. Although relapses were observed in 7.5% of individuals, they did not affect HRQoL at 180 or 360 days, and the improvement in physical and social functioning and mental health perception was maintained after PRM.

Acknowledgements This study was funded by Research Project 132/00 from the Consejeria de Salud, Junta de Andalucia and the FIS PI021394 Project, Spain. We acknowledge Dr. Jordi Alonso from the International Quality of Life Assessment (IQOLA) project for providing us with the Spanish version of the SF-36 Health Survey.

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